RampX5 Equipment Monitoring System
Users Manual

Version 1.0 22/02/2012

Designed and installed by
ECE*Fast*

Contents

Introduction to RampX5 3
Equipment Monitoring System (EMS) 3
Readings and Recording 4
Backfill of Data 4
Event Log 4
Naming & Display Conventions 5
Tag Name 5
Numerical Display 5
Digital 5
Checking of Settings 5
Access and Security 6
Creating Users and Assigning Permissions 6
Global, Group and Equipment Levels 8
Holiday Manager 9
Alarms & Alarm Messages 9
Alarm Message Recipients 9
Overview of Alarm Processing 9
Alarm Acknowledgement 10
Alarm Repeat 10
Alarm Hysteresis 11
Alarm Processing Flowcharts 12
Using the EMS 15
Compatible Browsers 15
Navigation of Web Pages 15
EMS Home Page 16
Colours 16
Overview Page 16
Configuration Pages 17
Global Configuration Page 17
Group Configuration Pages 18
Level Plan View 18
Room view 19
Equipment Page 20
The Database Navigation Bar 20
Graphical Display Tab 21
Log Tab 21
Reports Tab 22
Settings Tab 22
Equipment Setting Descriptions 23
Comments Tab 24

Introduction to RampX5

ECEFast RampX5.is a SCADA system implemented in Java. It contains a web server and the user GUI is accessed using a web browser. Data is presented to the user on dynamic html pages generated in response to user input.

RampX5 can be hosted on a wide variety of platforms. It has been tested on:

- Linux
- Windows Server 2008R2
- Windows XP
- Windows 7

Data is recorded and settings are stored in a PostgreSQL database. RampX5 and the PostgreSQL server generally run as services on the host server.

Any IO device that has a published communication protocol can be used with RampX5. Drivers are already available for Modbus, Modbus/TCP and Yokogawa Darwin. GSM modems can be used with serial or network connections.

RampX5 can interact with users and the physical world using:

- Web browser
- Bi-directional email messages
- Bi-directional SMS messages
- IO devices

Equipment Monitoring System (EMS)

The EMS is designed to monitor, record and send alarm messages for connected equipment. These are commonly fridges, freezers, incubators and liquid nitrogen freezers and room temperature and relative humidity.

RampX5 EMS software runs on a server that is maintained by IT. It communicates via the Ethernet network with the data acquisition units that can be mounted in any convenient location. Every 30 seconds RampX5 polls it to get the latest readings and at 2 minute intervals stores the current readings into a database and uses them to present the graphs.

The EMS software continuously checks these readings for alarm generation and management. It applies all the set points and delay times, online/offline settings to decide if a sensor reading is out of specification and has been out of specification for long enough to trigger an alarm message. It then applies all the alarm message management logic ie. is it in-hours or out-of-hours, which group does it belong to, are there unit specific alarm recipients defined, are there duplicate recipients etc to build a list of email and SMS messages to send a message to. It then sends the alarm message(s) and the alarm acknowledgement and re-send logic controls a repeat the message if required.

The integral web server provides the user interface and displays the current state of the inputs, allows for browsing or download historical data, and change of settings. A user management system control access to web interface.

All important events, like alarm event, set point change events etc are logged into the database and these can also be accessed via the web interface.

All of the day to day operational settings are accessible and adjustable from the web browser interface to users assigned the “Settings” permission. There are numerous other setting options possible by editing the configuration files on the server but this should only be done by or with instructions from ECEFast personnel.

Readings and Recording

The EMS software polls the data acquisition equipment once very 30seconds for sensor readings. These can optionally be scaled and are then displayed as the numerical readings in the EMS and used as by the alarms to determine the state of the inputs.

Every 2 minutes the readings are recorded in the database. This data is presented on the graphs and is available for historical viewing and reporting. By default recording is on for all items.

All readings from equipment are recorded at this rate unless the equipment is set to “Off” on the settings tab. There is no global way of turn recording off for all equipment.

For cases where the equipment is out of service, but recording of it is required, the unit can be put “On” and the alarm set points set wide enough to eliminate unwanted triggering.

Backfill of Data

The data acquisition equipment does not store readings. There is no backfill of data into the database if the communications link between the server and the data acquisition equipment unit is lost. The server running the EMS software, the data acquisition hardware and the network infrastructure in-between are all powered from UPS backed up power. A loss in communications indicates a major interruption or failure of power, hardware or IT infrastructure.

Event Log

The EMS Software records all significant events in the database as the Log. All events are time stamped.

At the Global and Group level the log records each change made to settings along with username of the operator and a time stamp.

At the Equipment level the log records:

- Setting changes.
- High Alarm events
- Low Alarm events
- Messages sent including the mobile phone number or email of the target and acknowledgments received. The success of the send attempt is also recorded.

- RampX5 EMS stop events
- Communication error events
- User text events

Naming & Display Conventions

Tag Name

All equipment connected to the EMS is assigned a unique tag name that identifies all data, graphs and alarm messages for that equipment.

The format is **XXXXY_Z** where:
XXXX is the room number and is always 4 digits.
Y is the equipment type, between 1 and 3 characters:

- *I* Incubator
- *C* Cool room
- *F04* Fridge
- *F20* -20C Freezer
- *F70* Ultra cold Freezer
- *FN* Liquid Nitrogen Freezer
- *R* Room Temperature

Z is a number to ensure the uniqueness of the tag name.

Numerical Display

Temperatures are displayed to a resolution of 1 decimal place. E.g. 37.1°C
CO2 levels are also displayed to 1 decimal place. E.g. 5.0%CO2
The time units used for alarm settings are in whole minutes.

Digital

Digital (ON/OFF) inputs and settings are displayed in one of three formats:

ON= OK = 1 = TRUE

OFF = ALARM = 0 = FALSE

Checking of Settings

The values entered are checked for validity as far as possible during entry. Numerical values all have a certain allowable setting range that is consistent with their function and not in conflict with other values E.g. High set points cannot be lower than low set points etc. Alarm destinations must resolve to a valid email address. mobile phone number or username. If a username is specified as a recipient then that user must already exist on the system and have at least one valid address set for them

Access and Security

Access to the web interface is controlled by a username/password login. There is one default user of RampX that has administrator permissions. All other users are created using the web User Administration facility.

It is strongly recommended that passwords be a minimum of 8 characters long and these be a combination of upper and lowercase alphanumeric characters.

Three unsuccessful login attempts will lock the client IP address out for 1 hour.

There is no limit as to the number of concurrent users.

Creating Users and Assigning Permissions

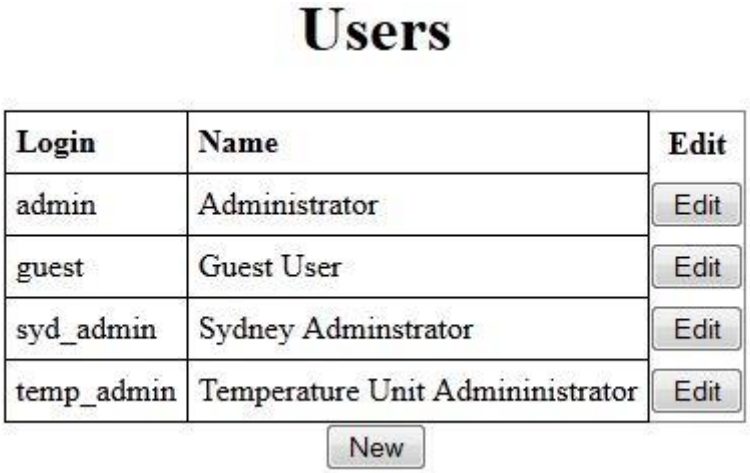
A user with the "User Administration" permission has access to the User Administration page on the web interface and can create and edit users and assign a sub-set of their own permissions to those users.

Permissions to view equipment, edit settings, add/edit the text event log and access to the administrative utilities such as User Administration and Holiday Administration can be customised for each user.

The start page of each user can also be defined. Normally it is the EMS home page but it could be set to a level, room or equipment view.

The password can be edited and mobile phone numbers and email address entered here to use as alarm message addresses.

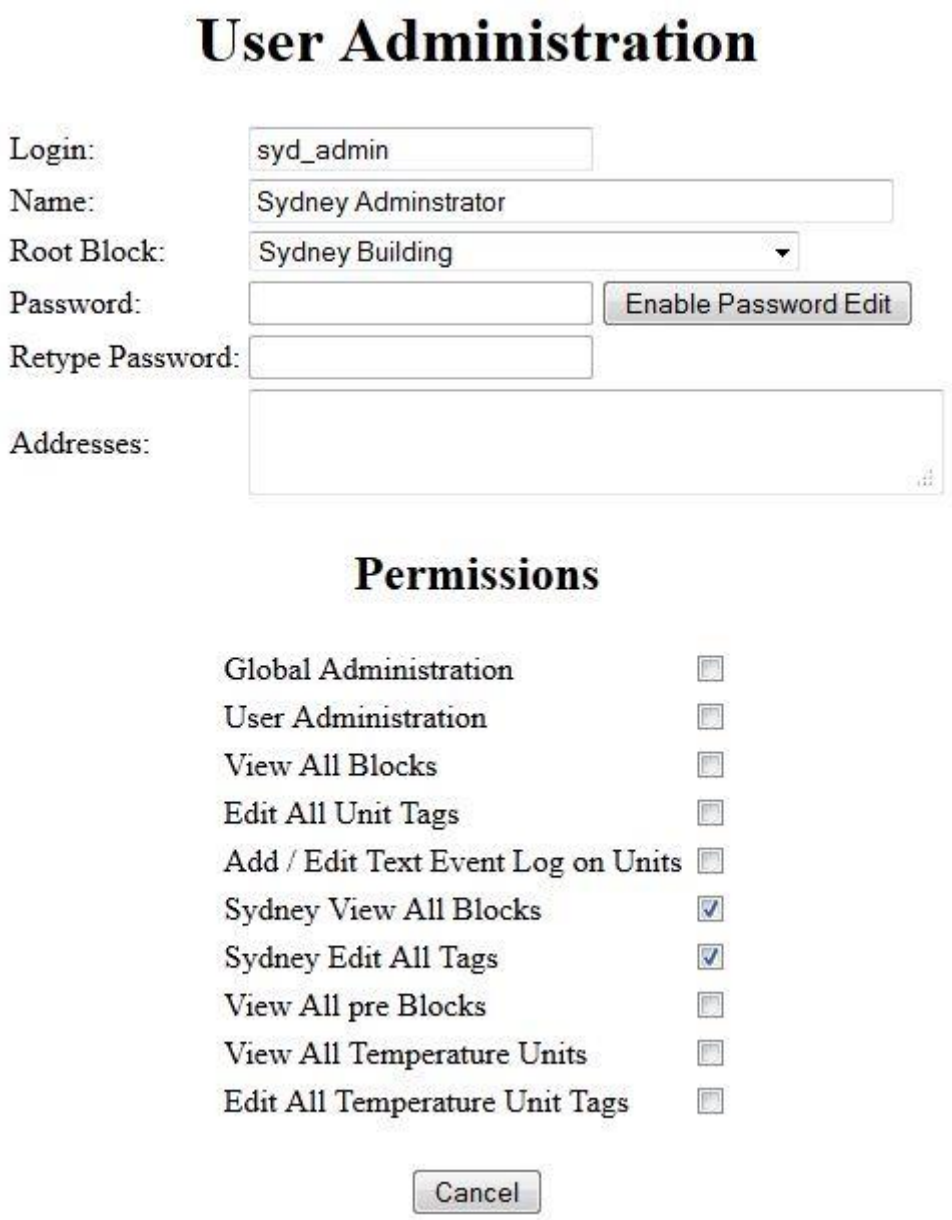
The User Administration page is available from any of the Configuration pages. The sub-set of users available to edit is dependent on you own permissions. For a user with Global Administration permission the page looks like this.



Clicking on the New or Edit button brings up the detail on that user.

The settable fields are:

- **Login** The username used to login to the system
- **Name** The real name of the user
- **Root Block** The first page displayed to the user after they login.
- **Password** The users password. Once entered this is not displayed and can only be changed afterwards by clicking the “Enable Password Edit” button and entering the new password details and clicking the save button at the bottom of the page.
- **Addresse**s List of email or mobile phone numbers for that user. These will be targets for alarm messages where their username is used as an alarm recipient.
- **Permissions** These allow restrictions to be placed on what users can view and edit.
    - **Global Administration** Allows un-restricted view and edit access to every control and every setting. As few users as possible should be given this permission.
    - **User Administration** A user with this permission may access the user administration to add and edit users with a subset of their own permissions. E.g. Group administrators who have been given edit access to their own groups tags will only be presented with the option of assigning a sub-set of these to users they create.
    - **Holiday Administration** Allows access to the Holiday Manager tool to define holiday periods where the Holiday recipient will receive alarm messages.
    - **View** Allows the user to view pages & settings but not edit any settings. View only users can be used as guest or security staff logins where information and equipment status needs to be visible and but not editable.



Global, Group and Equipment Levels

To allow for the logical assignment and administration of responsibilities for managing the EMS and actioning alarm messages generated by it there are three levels at which settings can be made: *Global*, *Group* and *Equipment*.

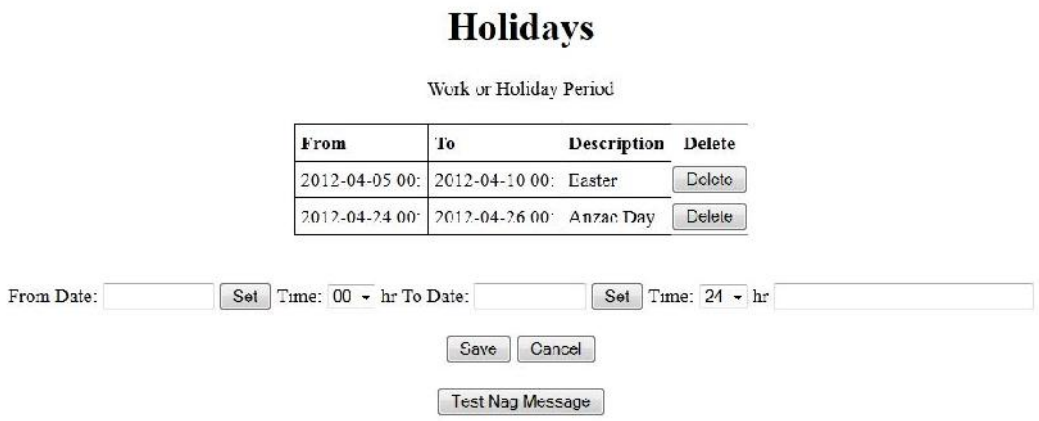
Equipment level settings affect that piece of equipment only. Alarm recipients can be optionally added at this level to receive alarm messages from this specific item only.

Each piece of equipment is assigned to one of the groups. In this case 5 groups have been defined: GROUP1 through to GROUP5. This allows a Group administrator and lower level users to be created for each one to view or maintain the settings associated with their group's equipment. Group alarm recipients can also optionally be assigned to receive alarm messages from equipment in that group only.

Global settings cover all equipment and include some special administrative settings such as the Heartbeat message recipient(s).

Holiday Manager

The Holiday manager is accessible from the Global Configuration page to users with the holiday administration permission. The start and end of holiday periods can be defined and during these periods of time the global alarm message recipient automatically changes to the holiday recipient.



Alarms & Alarm Messages

A high and a low alarm set point are available for each numerical input. For digital On/Off inputs the state of the input itself determines the alarm status, ON being OK and OFF in alarm.

All alarms are generated and managed by the RampX5 EMS software running on the server. Alarm messages can be any combination of email and SMS messages

The only situation where local settings on the equipment itself has any influence on alarms is when there is only a relay contact output from the equipment and the relay is triggered by the equipment itself.

Alarm Message Recipients

Alarm recipients can be assigned by their username, an email address or a phone number. Message recipients can optionally be assigned at the Global, Group or Equipment level for in-hours and out of hours alarm recipients. These recipients are cumulative with duplicates are filtered out. If holiday periods are used then a holiday recipient can also be defined.

Overview of Alarm Processing

Every 10 seconds the EMS software triggers the alarm processing routine. This checks the status of all readings for alarm generation and management and applies all

the set points and delay times, online/offline settings to decide if a sensor reading is out of specification and has been out of specification for long enough to trigger an alarm message. An entry is made in the equipment log.

It then applies all the alarm message management logic ie. is it in-hours or out-of-hours, which group does it belong to, are there unit specific alarm recipients defined, are there duplicate recipients etc to build a list of email and SMS messages to send a message to. It then sends the alarm message(s) and all the alarm acknowledgement and re-send logic determines if and when to repeat the message. All outbound alarm messages and incoming acknowledgments are entered in the log.

Alarm Acknowledgement

Alarms can be acknowledged by:

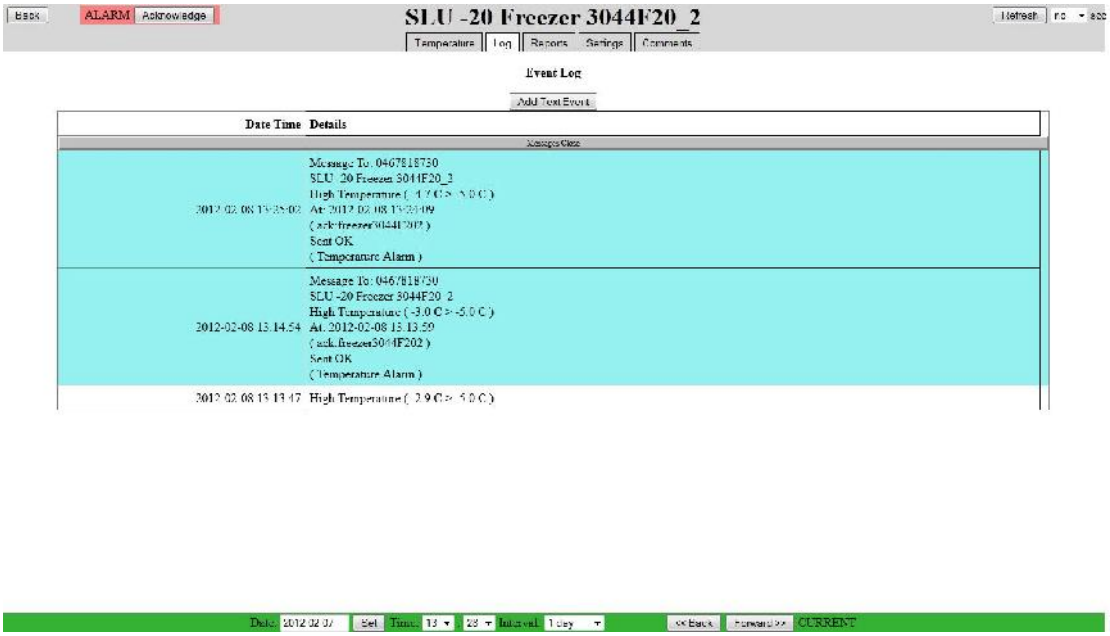
1. Clicking the “Acknowledge” button on the equipment detail display. The username entered in the log along with the acknowledge time stamp.
2. Replying to the SMS. The phone number of the replying phone is entered in the log along with the acknowledge time stamp.
3. Replying to the email. The email address of the replying message is entered in the log along with the acknowledge time stamp. The reply message must contain the string ack:Tag_Number.

Alarm messages will not be sent while an alarm is acknowledged. Acknowledgement lasts as long as the “Acknowledgment Time” set in the Global Settings. After this time if the reading is still out of specification then it is once again in alarm and alarm messages will be re-sent.

Alarm Repeat

If an alarm is unacknowledged and is still in the alarm state after the “Alarm Repeat Rate” time has elapsed then this will trigger alarm messages to be resent.

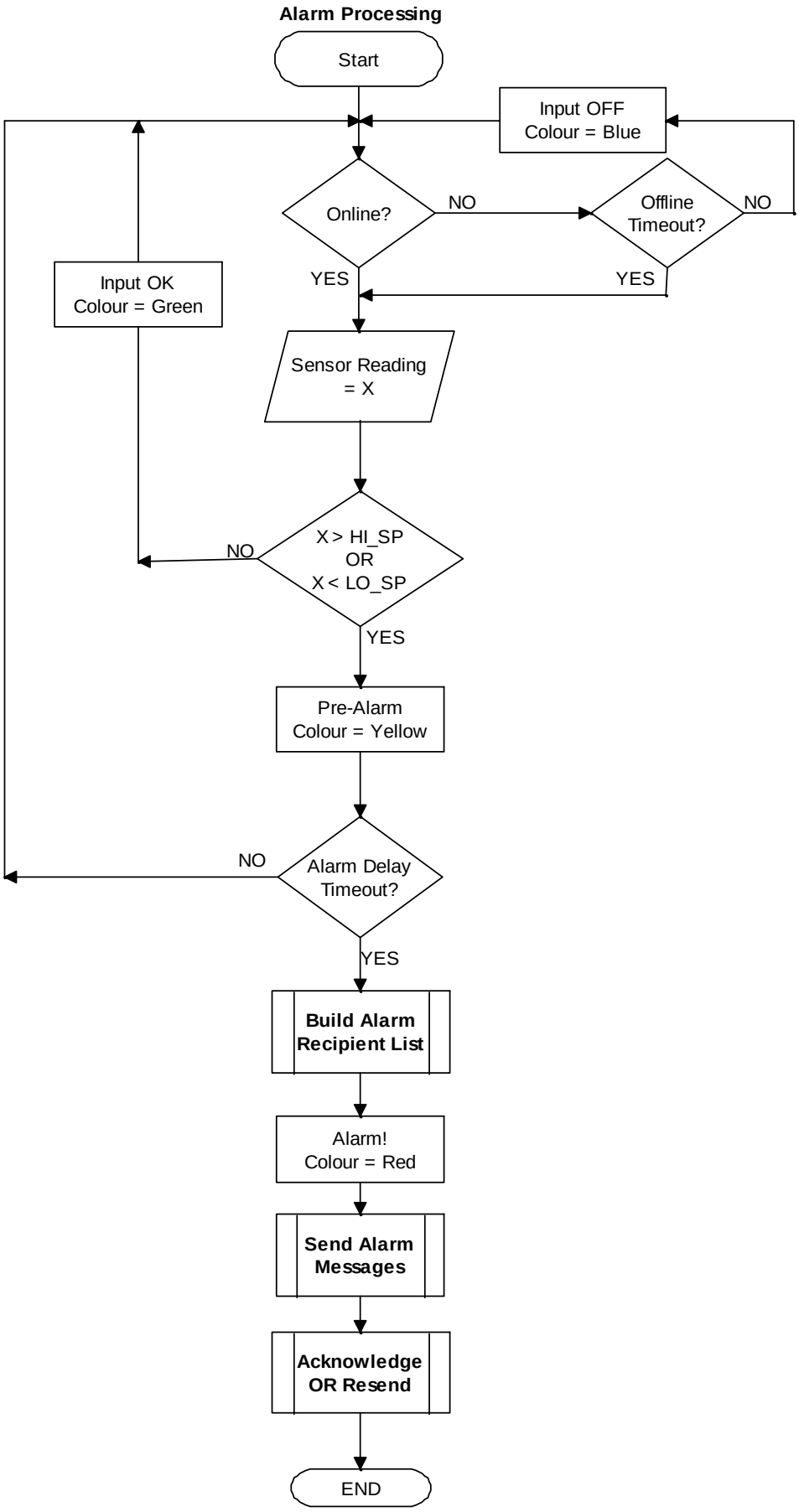
Freezer Log with alarm message event displayed.



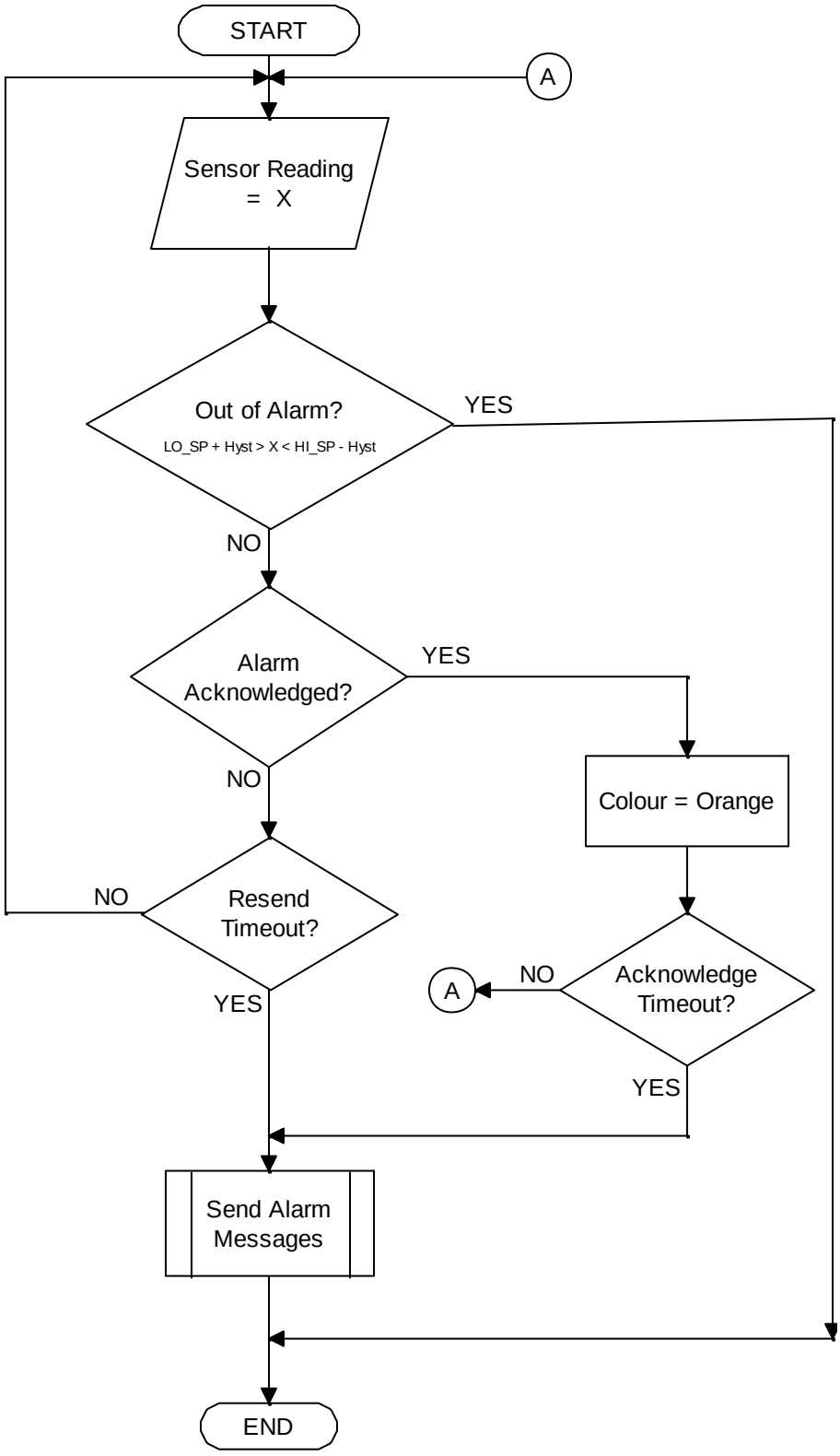
Alarm Hysteresis

In order to stop alarm the alarm “chattering” on and off if the reading is hovering close to a set point there is a 1°C hysteresis applied to the alarm set points. E.g the high alarm set point is 39°C then the alarm will trigger as the temperature rises above 39°C and will not reset unit it falls below 38°C.

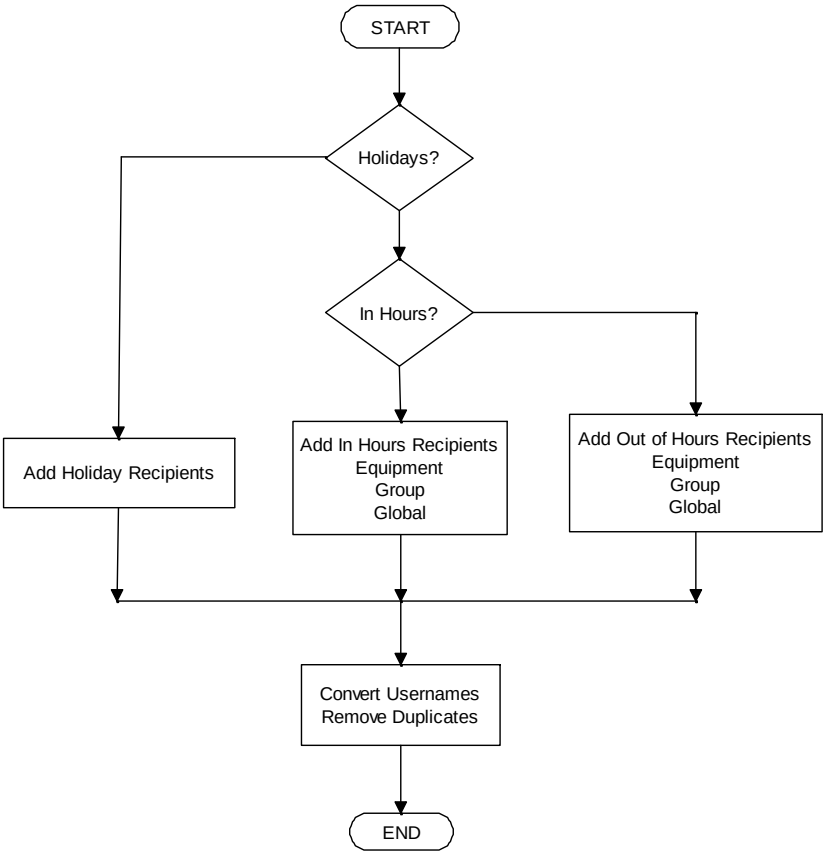
Alarm Processing Flowcharts



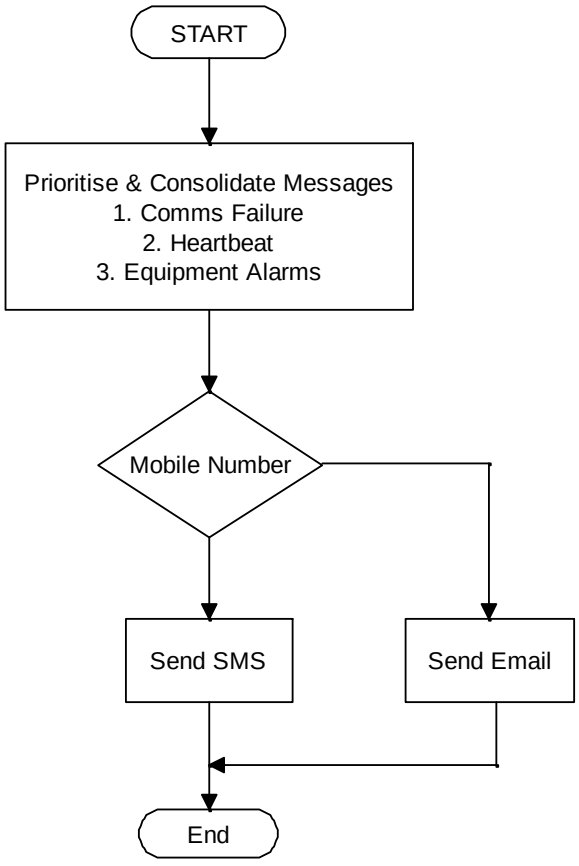
Acknowledge OR Resend



Build Alarm Recipient List



Send Alarm Messages



Using the EMS

The user interface to the EMS is via a web browser. The web pages are dynamically generated and served by the RampX5 software on demand by user input.

The pages use only standard html and a small about of Javascript to maximise the compatibility and display speed. No software installation is required to use the web interface.

Compatible Browsers

The pages are custom designed for the each EMS system and have been optimised to display efficiently on widescreen desktops computers, laptops and iPhone. It was been tested with IE8, IE9, Firefox & in both PC and iPhone versions and Chrome.

Other browsers have not been tested but it is expected the pages will display satisfactorily.

Navigation of Web Pages

EMS web interface is accessible at the URL defined by the IT administrator.

The login page is presented and logging on with the EMS username and password will allow access to the EMS home page.

There are four display levels, each of increasing detail: Home; Level; Room & Equipment.

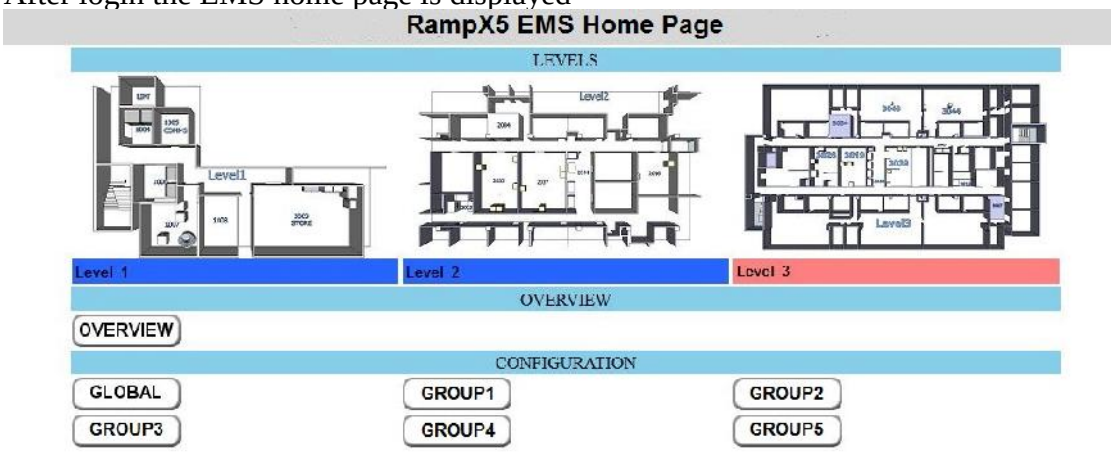
Important Note: Once displayed the pages are static and need to be refreshed to display the latest data. All pages have a “Refresh” button in the top right corner and also a drop down box to select an automatic refresh rate if desired.

All the pages except the home page have a “Back” button in the top left corner. On home page this is the “Logout” button.

There is an in-activity timer automatically logs a user out if no input is received after 30 minutes.

EMS Home Page

After login the EMS home page is displayed



The mouse cursor will change from a pointer to a hand over any hyperlinked area of the screen.

Colours

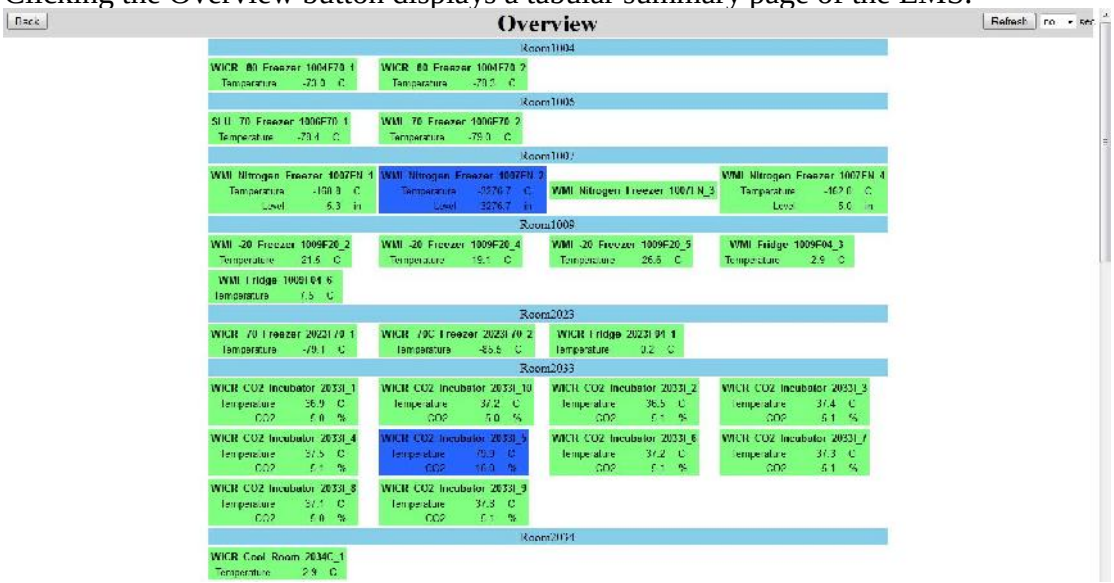
The status of all equipment on a level is indicated by the colour of that levels title block:

- RED If any equipment on the level is in alarm then the title block is red.
- YELLOW Pre-alarm. Alarm limit exceeded but alarm delay still active
- ORANGE Acknowledged
- GREEN If all equipment is OK then it is green.
- BLUE If some equipment is offline.

Red has display priority over all other colours. Yellow for pre-alarm and orange for acknowledged have display priority over blue and green.

Overview Page

Clicking the Overview button displays a tabular summary page of the EMS.



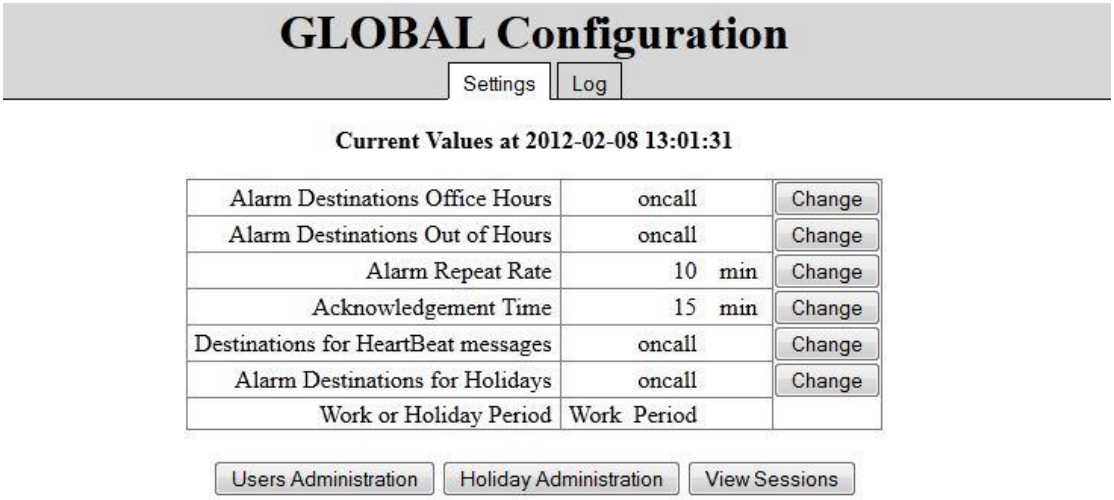
The display blocks are linked to the equipment detail page of that item so that every piece of equipment linked to the EMS is directly accessible from this page.

Configuration Pages

Navigation buttons on the home page access the Global and group configuration pages.

Global Configuration Page

This configuration page contains the administrative level controls and displays. Visibility of controls and settings is defined by the user's permissions. To administration users the page looks this.



The settings available are:

- **Alarm Destinations** Global in hours and out of hours recipients for alarm messages. These recipients receive the alarm messages from every piece of equipment and every system alarm. There is no limit on the number of recipients.
- **Alarm Repeat Rate** Time period after which an alarm is resent if it has not been acknowledged.
- **Acknowledgement Time** Time period after which an acknowledged alarm becomes and active alarm again and the alarm messages are resent.
- **Destination for Heartbeat** Message recipients for the daily heartbeat message.
- **Alarm Destination for Holidays** Alarm recipients for times defined as holiday periods in the Holiday Administration manager.
- **Work or Holiday Period** Displays the current period as defined by settings made in the Holiday Administration manager.

All changes to settings are recorded in the log along with a timestamp and username. The log page by default displays the last 24hrs events. The time period displayed can be temporarily changed with the database navigation bar at the bottom of the page.

Group Configuration Pages

The settings available are:

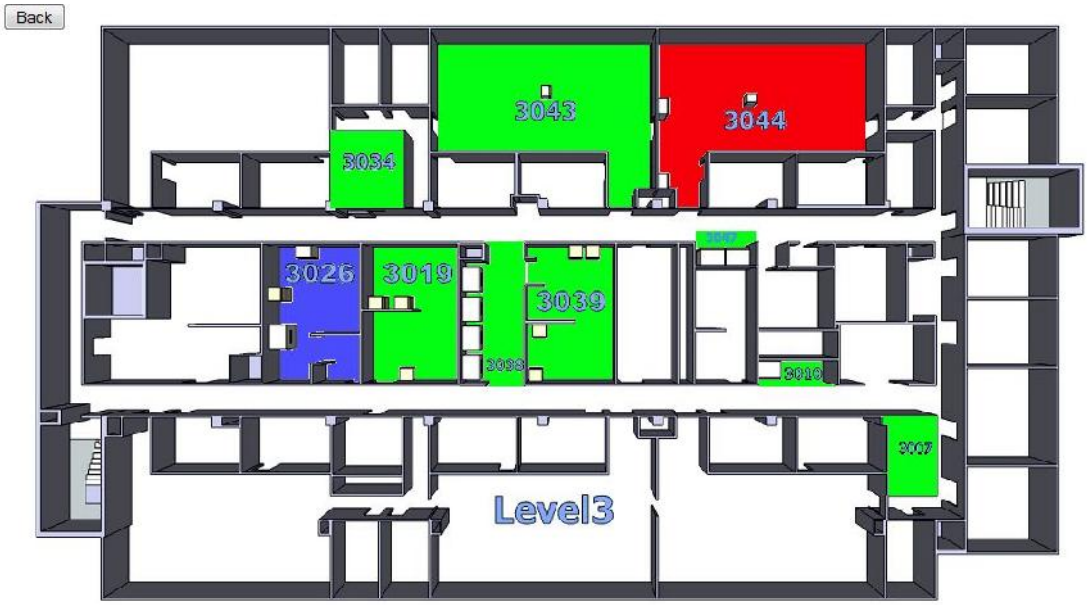
- **Alarm Destinations** Global in hours and out of hours recipients for alarm messages. These recipients receive the alarm messages from every piece of equipment in their group and are in addition to the global alarm recipients.

The User Administration tool can also be accessed from here. Users with Group level administration permissions can access the User Administration page from here to maintain their group's users.

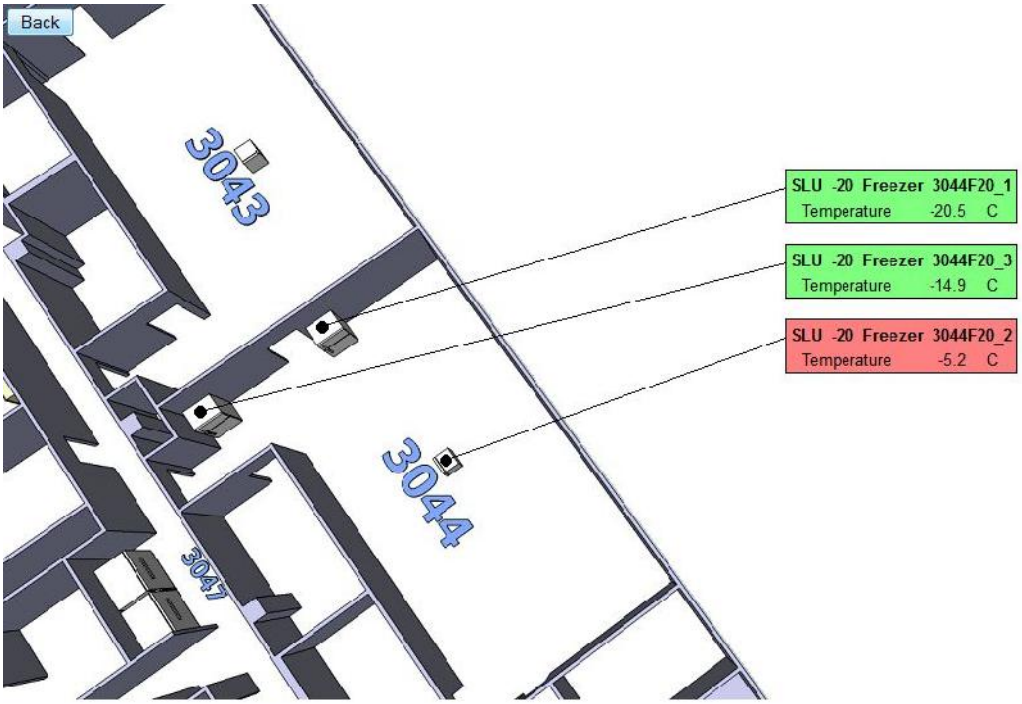
All changes to settings are recorded in the log along with a timestamp and username. The log page by default display that last day's events and the time period displayed is controlled by the database navigation bar at the bottom of the page.

Level Plan View

Clicking on one of the Level images on the home page will display that level layout in greater detail. Status of equipment in each room is again indicated by room colours.



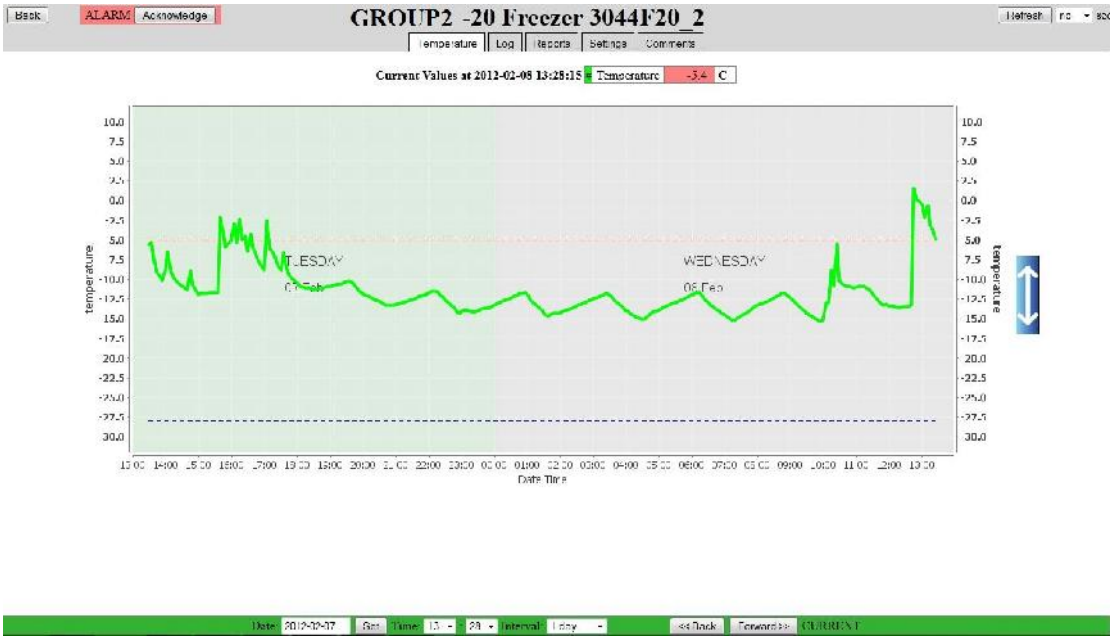
Room view



Clicking on a room displays a 3D image of the room with colour blocks for each item of equipment with the latest readings and status.

In the room view each equipment block displays that item's group, description, tag name, reading and status

Clicking on the equipment block displays the equipment page of that item.



Equipment Page

The equipment level page displays the detail information about one specific item of equipment.

The page title is that item's group, description, tag name, reading and status. If that particular item is in alarm then an "Acknowledge" button is also displayed if the alarm is un-acknowledged.

There will be one or two graphical tabs depending on how many physical values are being monitored, a log tab, a report tab if numerical values are being recorded, a settings tab and a comments tab. Digital On/Off items do not have a report tab as all changes in state are recorded in the log.

The Database Navigation Bar

Graph and Log pages take their data from the database and have a database navigation bar at the bottom of the page. Users can use this to display any section of historical data. By default the pages, Graphical or Log display the last 24 hours worth of data recorded for that item.

The three states of the Navigation Bar: Current, pending and historical.

The controls are:
Date: Sets the start day of the left hand edge of the graph or the bottom entry of the log. Clicking in the date box opens a calendar date selection pop up.
Time: Sets the start time of the left had edge of graph or bottom entry of log.
Interval: Sets the interval of data displayed. Youngest data is displayed on the right of the graph and the top of the log
Refresh: Once any of these controls has changed the colour of the navigation bar changes to olive to indicate one or more of the controls have been set a “Refresh” button appears. Once all the desired settings to the start day/time and interval have been made clicking the Refresh button will request the data from the server and refresh the display.
<<Back Forward>>: These controls allow the user to page through data one “Interval” at a time. The colour of the Navigation bar changed to brown to indicate historical data is being viewed.
Go Current: Button appears when historical data is displayed. Clicking it will refresh the page with the latest data appearing at the right hand edge of the graph, or the top of the log. The Navigation bar will change to green to indicate that the most current data is displayed.

Graphical Display Tab

There may be one or more graphical display tabs depending on the type of equipment. The graphical display starts with a display of the last 24hrs of data. The time frame of data displayed can be changed using the controls and refresh button on the database control.

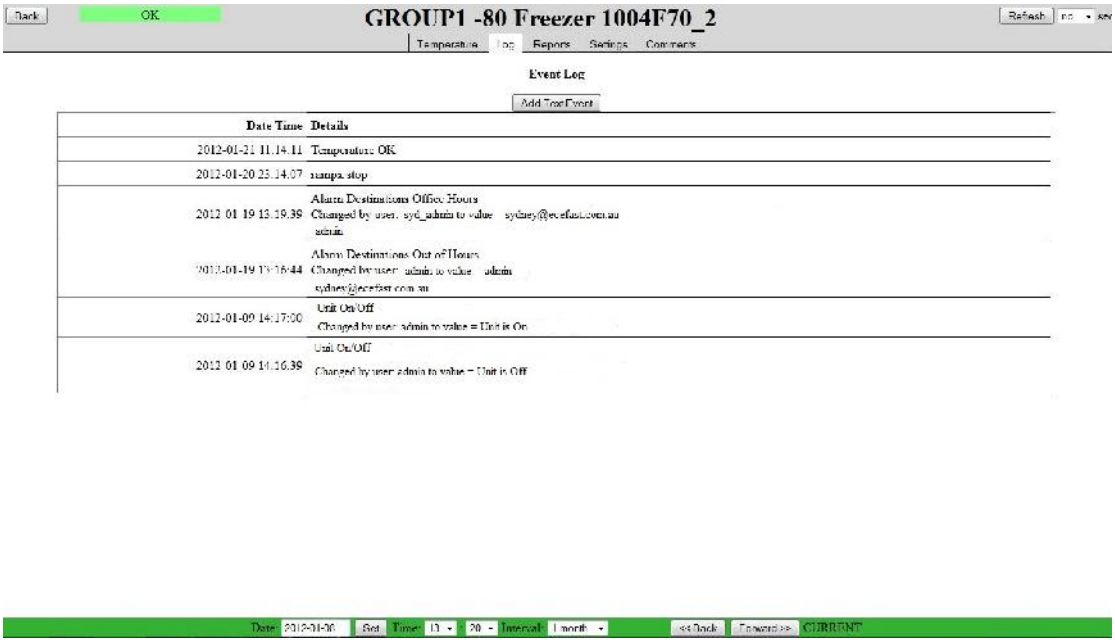
The double sided vertical arrow provides a quick y-axis auto-range and zoom of the graph. After using the auto-range function the browser “Back” button must be clicked to return the normal graph view.

Permanent changes to that equipments Y-Axis scaling can be made on the settings page.

Digital On/Off inputs appear on the graph as a trace at "1" for OK. In alarm the trace will drop to "0"

Log Tab

The Log tab by default displays the last 24hrs of database log entries. The time frame of log entries displayed can be changed using the controls and refresh button on the database control.



The details of what log entries are displayed here is detailed on page 5.

Users with the Add/Edit Text Event permission can add/edit text event notes in the log.

The details of alarm messages take up a lot of space on the page so they are by default displayed minimised as a horizontal bar. Clicking on the bar expands it displaying all the alarm message details, and it can be minimised by clicking on it again.

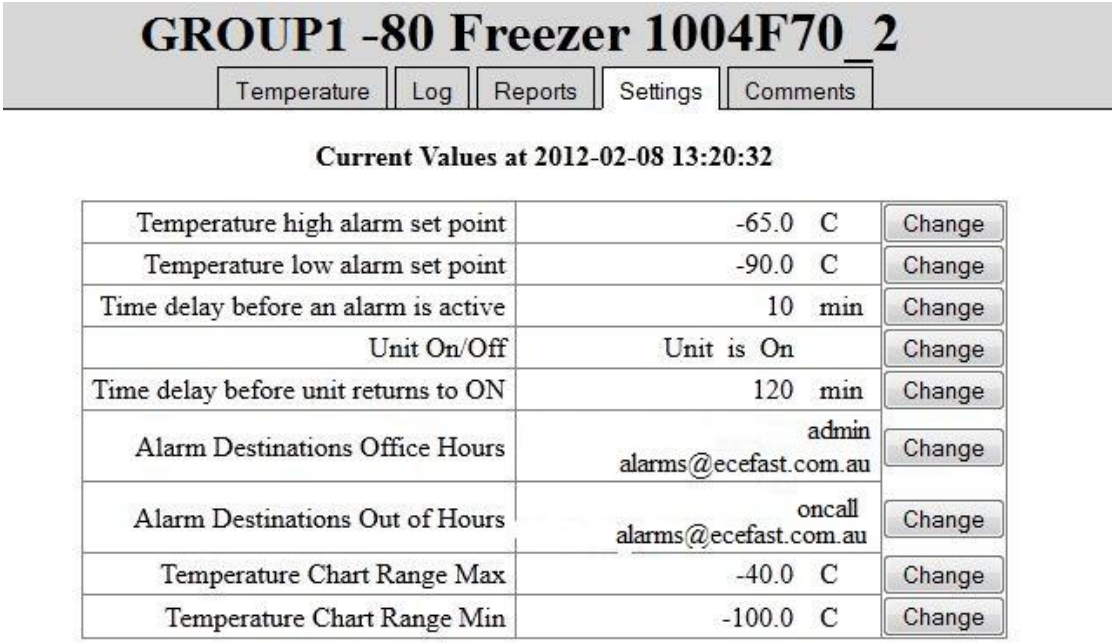
Reports Tab

There is only one report defined and that is to download the data currently displayed on the graph in .csv format.

Clicking the Run button will start a download of the file to your local computer.

Settings Tab

All the generally accessed settings for a piece of equipment are available on the Settings Tab. Users with Edit Settings permission can edit the values. All edits are recorded in the log with a time stamp and username.



Equipment Setting Descriptions

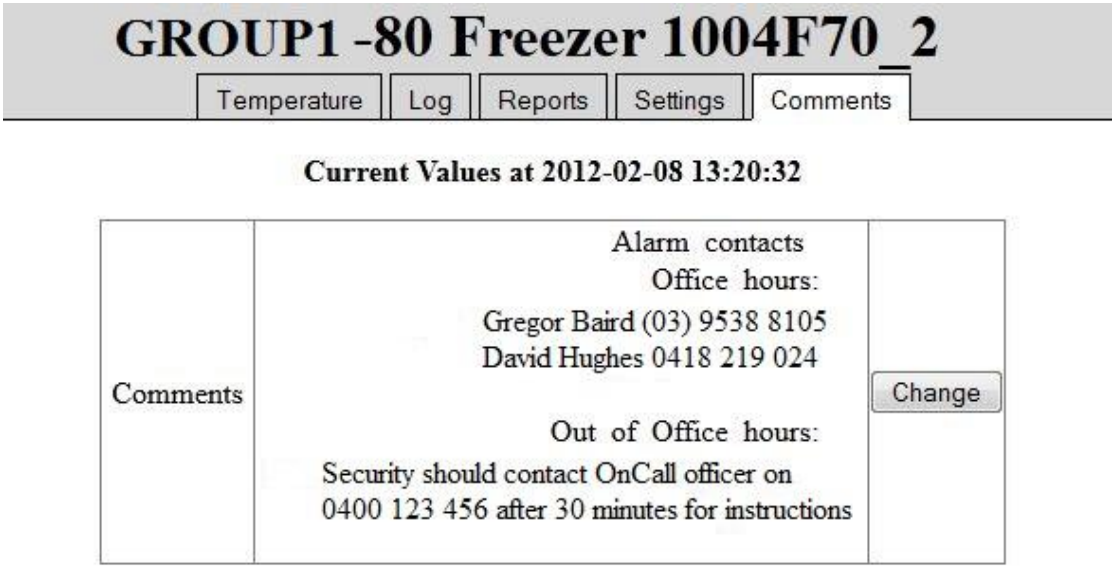
- **High Alarm Set Point** The value above which the alarm delay timer will start putting the equipment into pre-alarm.
- **Low Alarm Set Point**. The value below which the alarm delay timer will start putting the equipment into pre-alarm.

Note: There may be more than one of High or Low alarm settings present if there is more than one parameter associated with a piece of equipment E.g. Incubators.

- **Time Delay Before Alarm** Used to filter out false alarms. The value in minutes that the temperature or CO2 level must be continuously outside the alarm limits before an alarm message is triggered.
- **Unit On/Off** Puts the unit offline. Data is not recorded for it or alarms triggered while it is off line. Offline and Online events are recorded in the Log along with a time stamp and username. The unit will stay offline for the period of time set in the next parameter.
- **Time Delay Before Unit returns to On** The time in minutes the unit will stay offline before it automatically returns to online. Setting the value to 0 disables this function and units will remain offline until manually set to online again.
- **Alarm Destinations** In hours and out of hours recipients for this particular piece of equipment are set here. These recipients are in addition to the Group and Global recipients and is no limit to the number that can be defined here. Alarm destinations must be a valid email address, mobile phone number or username.
- **Chart Max & Min** Custom Y-axis limits of the chart can be set here if the standard limits for that particular type of equipment are not suitable.

Comments Tab

Each piece of equipment has a "Comments" tab where there is web editable text field for additional information about that piece of equipment, contact names phone numbers etc.



Editing is subject the user having that permission enabled for their login, but the text field can be viewed by any user with view permission.

ECEFast Victoria (Melbourne)
26 Business Park Drive
Notting Hill VIC 3168
Phone: (03) 9538 8111
Fax: (03) 9538 8199
Email:sales@ecefast.com.au
BOX 1230 Clayton South VIC 3169

ECEFast NSW (Sydney)
Level 1 Unit 51, 5 Inglewood Place
Baulkham Hills NSW 2153
Phone: (02) 8805 7500
Fax: (02) 8805 7599
Email: sales@ecefast.com.au
PO BOX 7578 Baulkham Hills 2153

ECEFast Queensland (Brisbane)
Unit 3, 505 Lytton Road
Morningside Qld 4170
Phone: (07) 3395 8888
Fax: (07) 3395 8988
Email: sales@ecefast.com.au

FREECALL 1800 811 818

ECEFast New Zealand (Auckland)
7/51 Ash Road
Wiri
Manukau City
Auckland
Phone: (09) 262 0206
Fax: (09) 262 0207
Email: salesnz@ecefast.com.au

Engineering and Thermal Products
(Gladstone)
4A Airport Shopping Village
281 J Hickey Avenue
GLADSTONE QLD 4680
Phone: (07) 4978 3380
Facsimile: (07) 4978 7393
Email: salescq@ecefast.com.au